Use of Maglev for Transportation in Future

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Abstract

This paper reviews how maglev or magnetic levitation technology works and how it has become an important part of us moving into the future. Although it is a difficult concept to grasp at first, many studies and researches have enabled us to understand the working principle behind this technology. Maglev technology is mainly used to help in transportation at relatively high speeds while using levitation or suspension with the help of superconducting magnets. Regardless of the high costs of setting up this technology, many countries including Japan, China and South Korea have already started using maglev powered trains as a mode of transport. Keeping this in mind and after modifying the same principle used in helping the trains levitate, we have thought of creating something of our own. It may seem fictional but it is possible. The idea is to create a hover board using maglev basics that may use a lot of magnets fixed on a rotating motor to help in levitation while high powered air blowers may be used in its movement. In the following segments present in the paper, we may be able to see how maglev technology works, it's basics and how it is being utilized now. Following this we will showcase our own idea and how it can affect lives around us. Maglev technology has a lot of potential to make our lives easier and this paper intends on showcasing that.

Keywords: *Magnets, Maglev, bullet train, levitation, hover board, technology.*

1.Introduction

The French-born American inventor Emile Bachelet filed the first patents for magnetic levitation (maglev) technology all the way back in the early 1910s. In 1904, American professor and inventor Robert Goddard had written a paper describing the theory of maglev levitation well before that. Based on this futuristic vision, it wasn't long before engineers started designing train systems. Soon, they claimed, travelers would board magnetically driven cars and zip at high speed from place to place, and without many of the conventional railroads' maintenance and safety issues. The big distinction between a maglev train and a conventional train is that there is no engine for maglev trains, at least not the type of engine used to pull typical train cars along steel tracks. The engine is rather inconspicuous for Maglev trains. The magnetic field created by the electrified coils in the walls of the guideway and the track combine to propel the train instead of using fossil fuels. We have taken the same principal of bullet train and modified it to create something which may seem fictional but it is actually possible. We have thought of creating a hover board using **Maglev** basics. Maglev is a system in which the vehicle runs levitated from the guide way (corresponding to the rail tracks of conventional railways) by using electromagnetic forces between superconducting magnets onboard the vehicle and coils on the ground.

2.Theory

2.1 Mechanism Used

We have seen while playing with magnets that opposite poles attract each other while same poles tend to push each other away. Magnets can also be created by wrapping a conductor around a solenoid and passing current through it, this is known as Electromagnetism. We know that according to **Lenz's law** the direction of induced current may also be found by this law, the law states in effect that electromagnetically induced current flows in such direction that the action of the magnetic field setup by it tends to oppose the very cause which produces it. This opposing force that is created when magnets continuously change directions can be used to levitate anything. This mechanism is already used in bullet trains.

2.2 Previous Methodologies/Implementations

Since the 1960s, in excess of 100 new guided transportation frameworks have been proposed as ideas, and a few dozens of them have been genuinely created and tried. As in every innovative work process, many of these ideas were unreasonable and infeasible, yet a couple have advanced to full development and fruitful execution. [1]

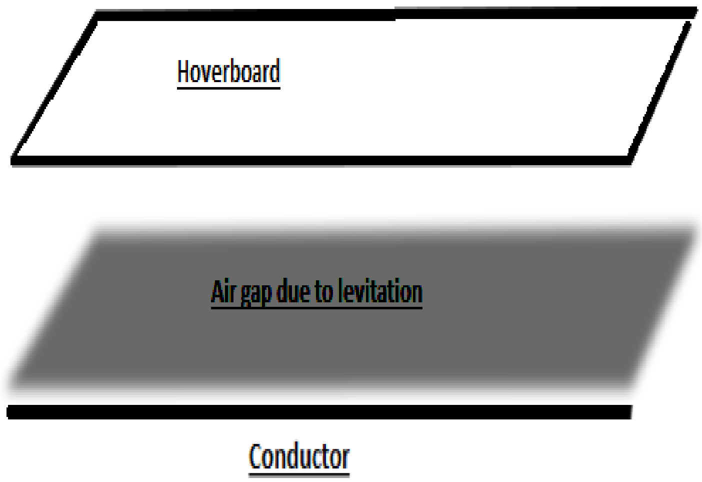
A short history of Maglev developments is introduced here Examples are the ALWEG Monorail (Seattle, Tokyo, and a few other Japanese cities), Westinghouse C-100 People Mover (in many airports, Downtown Miami), MATRA's VAL system (Lille, Toulouse, Chicago O'Hare Airport), UTDC's Sky train (Vancouver, Toronto—using Linear Induction Motors—LIM, like Maglev frameworks), and several others. Magnetic Levitation (the Maglev transportation framework) is another new technology for guided transportation frameworks with strong public allure in light of its unique feature: the vehicles are upheld also as propelled by attractive forces, so that there is no actual contact between wheels and guideway surfaces. [1]

The Maglev train is a noncontact framework that requires a directing power for prevention of lateral displacement. As on account of levitation, the direction is refined electromechanically by magnetic repulsive force or magnetic attraction force. [2][3][4][5]

3.Proposed Implementation

The hover board may use a lot of magnets fixed on a rotating motor and may be placed on a moderately thick conducting sheet of metal. We may put high power air blowers to accelerate and turn the hover board in different direction. The flow of air can be controlled using a wireless controller. The air blowers may be wirelessly connected to the controller using a programmable motherboard. The air flow from the back may be enough to push two fully grown adults and can be used as transport. Also large construction sites can use this hover board to carry heavy loads from one place to another effortlessly some obvious modifications to the hover board. The board may have air flows on the sides as well at 45° angle to turn the hover board. The downward force created by the rotating magnets can be calculated by $\mathbf{F = BIL\sin\theta}$. This can be modified according to the needs. The force created by the high power air blowers can be measured by $\mathbf{Aev}^2$ where $\boldsymbol{A}$ is the area through which the air is blowing**,** $\boldsymbol{e}$ is the density of air and $\boldsymbol{v}$ is the velocity with which the air is flowing. To make the board move forward we may turn on the air blowers in the back which may push it forward. To turn left and right we may turn off the back thrusters and turn on the right and left thrusters respectively, and for braking we may have a thruster in the front which may blow air with constant force until the hover board stops. To reduce **eddy currents,** we may cut the conductor that is placed underneath to small equal sized

pieces. We may use lithium ion batteries to power the rotators which rotate the magnets under the hover board.



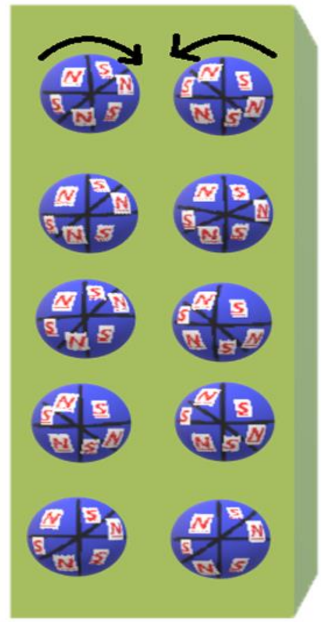


FIG 1. Schematic Diagram of the figure.

FIG 2. Overview Diagram of the Hover Board.
(Placing of magnets and the direction of the rotation).

3.Challenges

Although Hover Board in the future may make transportation via roads very fast paced and comfortable however building a hover board comes with its own set of challenges:

1. We may need high power lithium ion batteries which are not easily available in the markets.
2.For using hover board the roads should have some kind of path made of any conductor.
3.We may have to design the hover board for maximum safety of the user.

4.Conclusion

The hover board powered by maglev technology may be efficient and can travel at high speeds with minimum risks. No ground friction may act on them and thus they can move freely without much hindrance. In the near future, many more projects can use this as their building blocks while making our lives more easier. Maglev technology is not only
bound to transportation only. It has great potential in other fields too like healthcare and nuclear and civil engineering. As more researches take the future of maglev technology looks brighter than ever.

5. Acknowledgements

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